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USER PERSPECTIVE REGION SPECIFIC MARKET ANALYSIS FOR CUSTOMER RELATION MANAGEMENT USING MULTI MODE NETWORKS

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ABSTRACT

The growing product orient market introduce more challenges for the market analysis people to come up with more strategic ideas about the current market. The purchase habits of peoples are changing according to various factors like geographic region, life style, social environment, personal income, age and the social groups they belongs. The business organization has the responsibility to maintain the morality of the users and have to knew about their interest changes. Earlier the customer relationship has been maintained through set of tools like their mode of purchase habits and the frequent patterns generated using data mining concepts. Those systems are not suitable for modern world where the peoples are grouped in variety of ways like social networks and they communicate and share their day to day activities and their purchases and even a single routine of their life with their friends in the groups. But still the organizations has the responsibility to maintain their relationship with their customers and they have to track their interest changes. For example the peoples living in eastern countries has different interest of fabrics and costume they wear which is different than the people living in asian countries. This phenomenon is more suitable inside the country also, like change of interest between states. To solve this problem, we propose a user perspective region specific market analysis approach using multi mode networks for customer relation management. In this approach the peoples are clustered according to various factors based on the region where they live and based on clustered results the users interest is identified and the group user interest also identified. Based on identified groups and their interest, the proposed approach recommends set of upcoming product information to them. The proposed approach also enables the organizations to find out the market strategy of products and support the organizations to take market solutions in business intelligence.

Key Terms: *Market Analysis, CRM, Multi Mode Networks, Interest Changes, Product Growth.*

1. INTRODUCTION

The main task of business intelligence is the market analysis which support the business in many ways like estimating the product growth and business estimation or future market. The market analysis is performed in a time variant approach like the movement of any product in

different time line. Any product may have different market movement in different time, and the up's and down's in the product movement may be affected by many factor. For example, the growth of the product may be due to the absence of competitive product and the down may be the entry of new product as a competitive one. Not only this, there are many other factors which affects the movement of any product in the market.

Eventhough there are many factors which affects the movement of any product in nature, but the user interest is the most affecting factor in the market of any product. The user interest on any product for example, when we think about the cosmetics the user may be interest in using a particular type cosmetics but it will be keep changing according to different factors like the entry of modern product of same, or the products suggested by their friends and what the other are using and so on. The interest of users are differ from region to region, because the people living in different region has different type of interest like wearing different kind of clothes. For example, the people living in asian countries has different dressing sense than the Europe. This will be suitable for the internal states of any country, similarly the interest difference occurs based on various other factor, for example, the people living in same geographic region does not have the same kind of dressing sense due to the varying lifestyle, income, education, status and so on.

The customer relation management is the process of maintaining the morality of the customer that the organization is doing everything for the customer. So that the organization has to keep track of customer behavior changes, the lifestyle changes, the interest changes, and the market changes by monitoring what kind of product the user is most interested and what kind of conversation is happening between the customers and the organization has to maintain different market strategy for different region and has to deploy such products in those regions.

Multi Mode Networks are one where the users are considered as the nodes of the network and any single user may be in contact with N number of user so that there exist M modes for each user. The popular social network is the one which imitates the multi mode network where a single user in the social network has linked with more number of users in the network like Twitter, Face book and so on. The implication of social network has great impact in market strategy because the users of the social network shares various information between them and this induces the other region people to shift over to such a style or using such items. This greatly affects the market strategy and the organization has to keep track of such changes and prepare to fight with such products.

By keeping all these factors in mind the researchers has to find out an efficient solution to support customer relation management and to support business intelligence.

2. RELATED WORKS

There are many approaches has been discussed for the development of customer relation management and we discuss few among them here in this section.

Exploring the Relationship Between Mode of Operation and Performance of Support Teams in Telecommunication Companies [1], addressed the performance of virtual teams carrying complex technical support tasks in telecommunication companies. The primary proposition of the study that there is a relationship between team performance (comprised of three factors, namely, goals achievement, customer satisfaction, and team health) and the mode of operation was tested. A secondary proposition that team size has a significant effect on the relationship between the mode of operation and support team performance was tested also. One hundred twenty support professionals working for telecommunication companies based in California's Silicon Valley completed web-based surveys, which offered data on support operations in virtual and face-to-face settings and assessment of teams' performance in each setting. Whereas the findings indicated correlations between the mode of operation and the three factors of support team, further analysis indicated weak linear relationships among the variables. In addition, data analysis failed to support a significant effect of team size on the relationships between mode of operation and the three measures of support team performance.

Exploring the Three- Path Mediation Model: A Study of Customer Perceived Value [2], investigates the direct and indirect relationship between service quality and behavioral intention and probes into the mediating role of customers' perceived value and customers' satisfaction in the indirect relationship between service quality and behavioral intention. The findings suggest that service quality and behavioral intention relationship is mediated at multiple levels as their relationship passes through the junctions of customer perceived value and customer satisfaction.

A review of customer relationship management: successes, advances, pitfalls and future [3], provide academics and practitioners working with customer relationship management (CRM) with a review of key topics, such as advances in CRM, the shifting role of consumers, issues with conceptualization and consumer exploitation. The authors further integrate concepts of fairness, trust and paradoxes of one-to-one marketing, which are little researched within customer management. As a result, the authors suggest eight propositions for improving the CRM scheme.

Customer Relationship Management (CRM) Processes from Theory to Practice: The Pre-implementation Plan of CRM System [4], provides an extensive review of the literature regarding the CRM processes. This review aims to increase the understanding of the different perspectives and the various types and levels of CRM processes. This paper reveals that there are

four major perspectives of CRM processes which are customer facing level processes, customer oriented processes, cross functional CRM processes, and CRM macro-level processes. This paper recommends that for ensuring the successful adoption and implementation of any CRM initiative, organization should understand the different levels of CRM process and the integrated activities among the CRM processes at each level. In addition, for organizations to be successful adopters and implementers of CRM programs/systems, they should understand the need for business process reengineering and effective anticipation and management of the change that may accompany any CRM initiative. This paper suggests a pre-implementation plan for CRM programs/systems. Such a plan aims to initiate and communicate a customer-oriented culture within the organization. This step emphasizes on increasing the understanding of CRM concept and communicating and spreading the knowledge of the promising benefits of CRM programs/systems to all parties in the organization. All that will contribute in increasing the success rate of CRM programs/systems implementation.

Semantic Representation and Computation of Cloud-Based Customer Relationship Management Solutions [7], introduces a RDF vocabulary to semantically represent and compute quantitative indexes with the aim of providing a context-aware system to manage Customer Relationship Management (CRM) quality indicators. This tool is based on CRM Index, tailor made index based on Service Measurement Index to measure cloud CRM solutions. Apart from the tool itself, in the paper the authors introduce categories and attributes defined for the CRM world along with specific metrics.

How to Improve Customer Relationship Management in Air Transportation Using Case-Based Reasoning [12], describes research that aims to provide a new strategy for Customer Relationship Management for Air Transportation. It presents our proposed approach based on Knowledge Management processes, Enterprise Risk Management and Case-Based Reasoning. It aims to mitigate risks facing in air transportation process. The principle of this method consists in treating a new risk by counting on previous former experiments (case of reference). This type of reasoning rests on the following hypothesis: if a past risk and the new one are sufficiently similar, then all that can be explained or applied to the past risks or experiments (case bases) remains valid if one applies it to the new risk or for new situation which represents the new risk or problem to be solved. The idea of this approach consists on predicting adapted solution basing on the existing risks in the case base having the same contexts.

Performance Measurement for Customer Relationship Management (CRM) [13], reviews and critiques CRM performance measurement tools found in the literature and reports results from a survey establishing current CRM performance measures adopted by a sample of companies.

All the above discussed methods considered only few factors and does not consider about the interest changes and produces less accuracy in customer relation management.

3. PROPOSED METHOD

The proposed user perspective region specific market analysis approach has various stage of maintaining customer relationship namely preprocessing, Region based Multi Mode clustering, Group Interest Identification, Market strategy Generation. We discuss each of the functional component in detail in this section of the paper.

3.1 Preprocessing:

The customer access log or the purchase log and their personal information are stored in a log. The log will be retrieved and the retrieved log will be identified for all possible features. Once the set of features of the log has been identified, then for each of the entry, the presence of all the attributes will be validated and if any of the attribute is missing then the entry will be removed from the log.

Algorithm:

Input: Customer Log Cl.

Output: Preprocessed Log Cl.

Step1: start

Step2: Extract set of all distinct features of log.

Feature Set Fset = $\sum_{i=1}^{size(Cl)} \sum Attr(Cli) \nexists Fset$

step3: For each log l from Cl

if $l \nexists \sum Attr(Fset))$ then

Cl = Cl∩l

end

End

Step4: Stop.

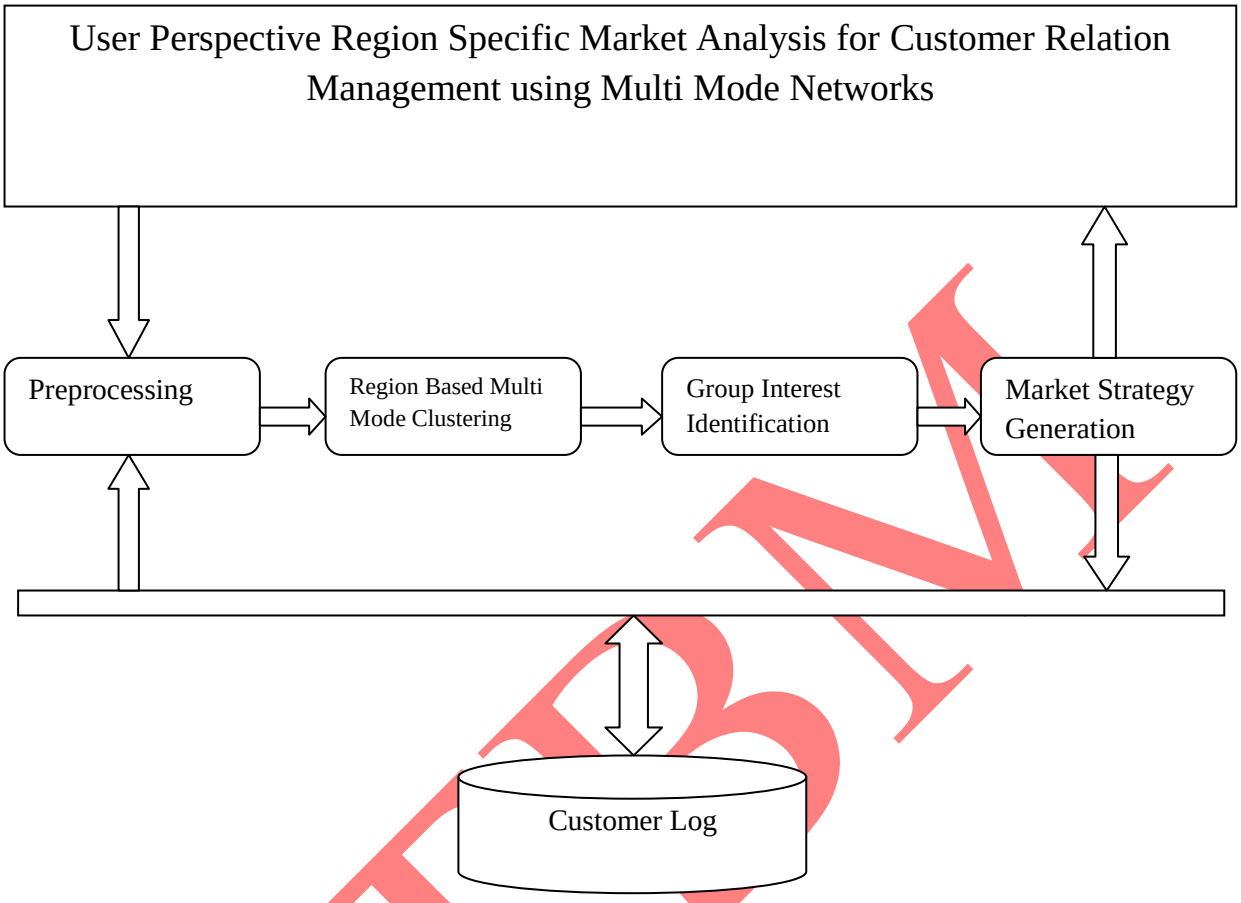


Figure 1: Proposed System Architecture

The Figure 1, shows the architecture of the proposed solution and the functional components of the proposed approach.

3.2 Region Based Multi Mode Clustering:

The region based multi mode clustering is performed on the preprocessed log. For clustering the method uses multi modes namely the region, profession, income, and so on. We read all the log and the method maintains number of clusters according to the number of regions considered. For each region or cluster we consider there exist set of subspace which is considered as a sub group where the data points or the logs are assigned according to the features considered earlier. For each log l from the log set, we identify the exact cluster or sub group based on the features like region, profession and range of income. The clustered result will be used to perform market strategy generation.

Algorithm:

Input: Preprocessed Log Pl.

Output: Cluster Cs

Step1 start

Step2: initialize number of clusters according to number of regions.

CS = $\sum_{i=1}^{size(Region)} Cluster(EmptyPoints)$

Step3: for each log l from Pl

Extract the features Region,profession,income.

Fs = $\sum l(Region, Profession, Income)$

for each cluster Cl from CS

Compute multi attribute similarity.

MAS = $\sum_{i=1}^{size(Cl)} \sum(Cl(i).Region == Fs.Region)$ && $(Cl(i).Profession == Fs.Profession)$&& $(Cl(i).Income == Fs.Income)$

end

Choose maximum similarity cluster Cl.

Assign log to the cluster.

CS(i) = $\sum(Logs \in Cs(i)) \cup l$

End

Step4: Stop.

3.3 Group Interest Identification:

The group interest identification is performed based on the clustered results. From each of the cluster and the subspace available, we extract the logs of transaction and identify the most purchased product at each time window. Based on this the group user interest is identified by

computing product frequency at each time window. Using computed product frequency a product with most frequency at each time window will be selected as interest. Based on selected interest the most product frequent item are identified and constructed as transition pattern.

Algorithm:

Input: Cluster Cs.

Output: Group user interest transition pattern Tp.

Step1: start

Step2: for each cluster Ci from CS

for each sub space Sp

Extract the data points Dp = $\sum_{i=1}^{size(Sp)} Data\ points \in Sp$

Identify unique item UI = $\sum Items(Dp) \nexists UI$

For each time window Ti from Tw

for each item I from UI

Compute product frequency PF = $\frac{\sum DP(i) \in I}{size(Dp)}$

end

end

for each time window Ti from Tw

choose the product with most product frequency.

Ps = $\sum_{i=1}^{size(Tw)} Max(PF(Ti))$

end

Convert them into transition pattern TP.

Tp = {Ps(Ti),Ps(Ti+1),…,Ps(Ti+n)}.

end

Step4: Add the pattern to the pattern set TPS.

$$TPS = \sum Pattern(TPS) \cup TP$$

Step5: stop.

3.4 Market Strategy Generation:

The market strategy generation is performed at regular interval using number of time window. At each time window, the method performs the region based multi mode clustering and then identifies the group user interest which returns the interest transition pattern. The generated interest transition pattern will be given as the market strategy for the business intelligence. From the interest transition pattern, the organization can identify which product has more impact on different regions and the competitive one also.

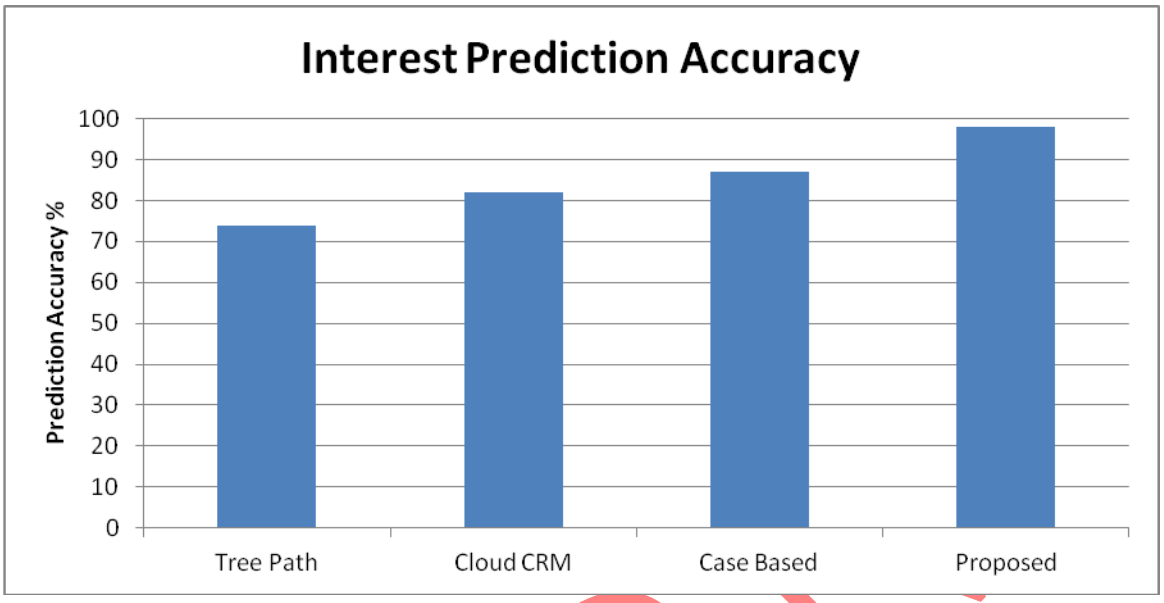
4. RESULTS AND DISCUSSION

The proposed region based multi mode clustering approach for customer relationship management has been implemented and tested for its efficiency. The method has been implemented in advance java programming language with large set of data set which contains enough transaction information. The method has produced efficient results in identifying the group user interest as well as interest transition.

Parameter	Value
Platform of implementation	Advanced Java
Size of log being used	1 million records
Number of attributes or items	200
Number of decision factors	3,Region,Income,Profession

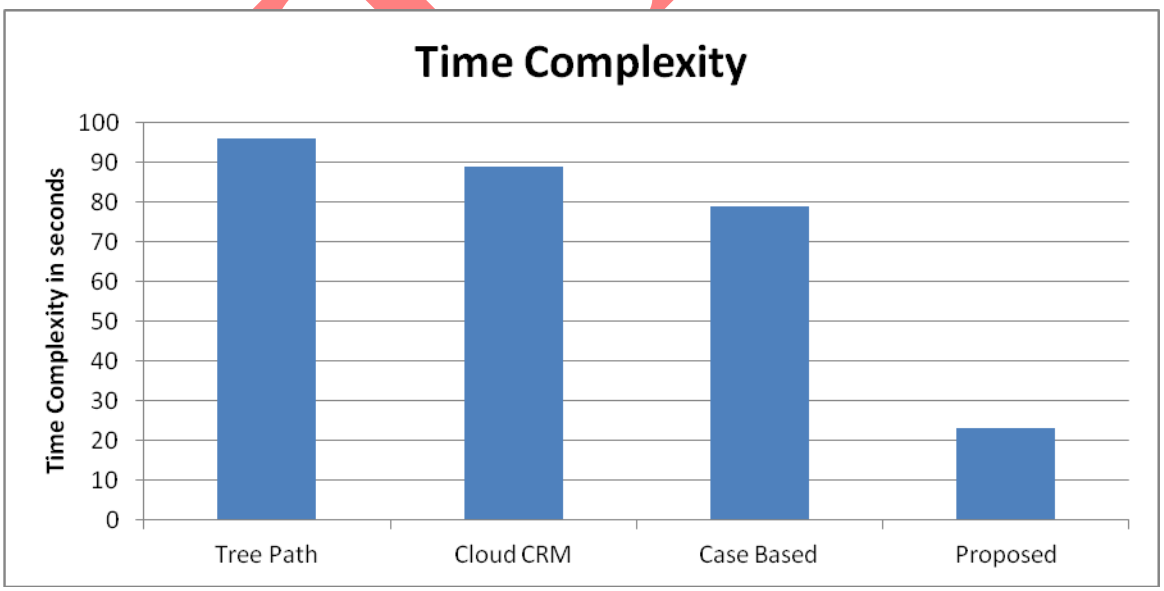
Table 1: Details of evaluation parameters

The Table 1, shows the details of evaluation parameters and it shows the details of value being used to evaluate the performance of the proposed approach.



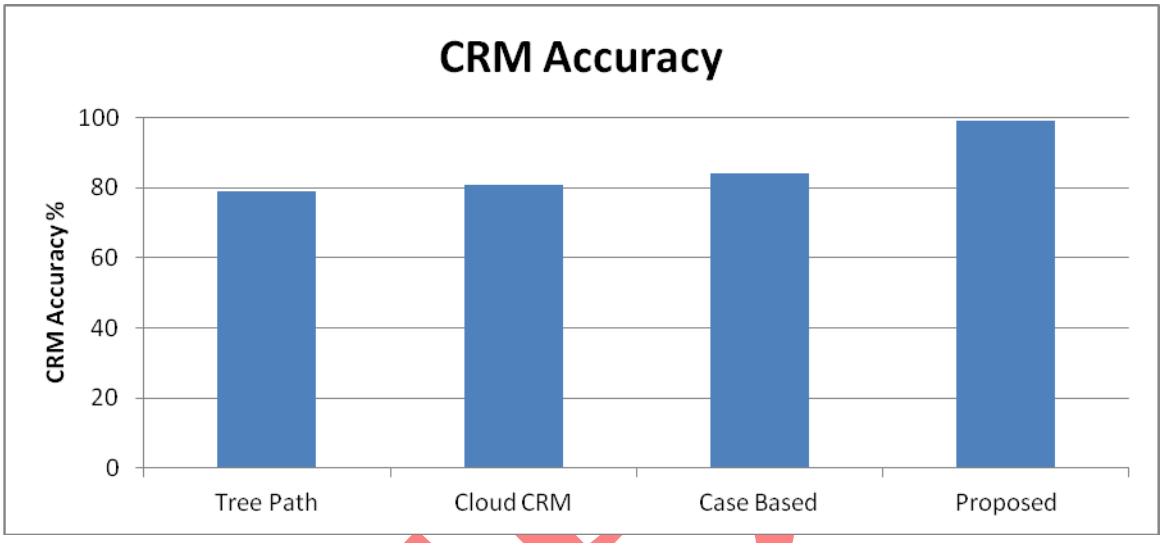
Graph 1: Comparison of interest prediction accuracy

The Graph 1, shows the comparison of interest prediction accuracy produced by different methods and it shows clearly that the proposed method has produced more accuracy in interest prediction which helps to maintain the customer relationship in more efficient manner.



Graph 2: Comparison of time complexity in interest prediction

The Graph2, shows the comparative result on interest prediction time complexity produced by different methods and it shows clearly that the proposed method has produced less time complexity than other methods.



Graph 3: Comparison of CRM accuracy of different methods.

The graph 3, shows the comparative analysis on customer relationship management accuracy produced by different methods and it shows clearly that the proposed method has produced more accuracy than other methods.

5. CONCLUSION

We proposed a user perspective region based market analysis framework for customer relation management using multi mode clustering. The method preprocesses the transaction log to remove the noisy records and the noise removed records are used to perform multi mode clustering. At the clustering stage, the method identifies the attribute set and groups the records according to the factors considered like region, profession, income. Based on the grouped records or cluster produced the group user interest is identified. The method computes the product frequency for each of the item present in the transaction log, based on that the interested item at different time window is being identified. The identified interests are formulated as transition pattern, using which market strategy is generated. The proposed method has produced efficient results in identifying the group user interest and reduces the time complexity also.

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